

CLAIMS

1. A liquid crystal optical shutter having an aperture window (124), said optical shutter comprising:

- a first electrode pattern (112; 212) arranged on a first essentially planar substrate (110; 210),
- a second electrode pattern (122; 222) arranged on a second essentially planar substrate (120; 220), wherein the first and second substrates are provided at a predetermined mutual distance (d), and
- liquid crystal material provided between the first and second substrates,

characterised in that

- the first and second electrode patterns (112, 122; 212, 222) each comprises a series of essentially parallel row electrodes (112a-g, 122a-g),
- wherein the series of row electrodes (112a-g) of the first electrode pattern (112) are aligned at an angle of less than 45 degrees with the series of row electrodes (122a-g) of the second electrode pattern (122) so as to create a high internal electrical resistance in series with any point in the liquid crystal optical shutter, whilst maintaining the overall external resistance of the optical shutter at a low level.

2. The optical shutter according to claim 1, wherein the series of row electrodes (112a-g) of the first electrode pattern (112) are aligned at an angle of less than 25 degrees, preferably less than 10 degrees, and most preferably

essentially parallel with the series of row electrodes (122a-g) of the second electrode pattern (122).

3. The optical shutter according to claim 1 or 2, wherein the row electrodes of at least one electrode pattern are electrically connected in parallel.

4. The optical shutter according to claim 1, 2, or 3, wherein each of the electrode patterns comprises a contact surface (112h, 122h) electrically connecting the row electrodes in parallel.

5. The optical shutter according to claim 4, wherein the contact surface (112h) of the first electrode pattern and the contact surface (122h) of the second electrode pattern are provided on opposite edges of the optical shutter.

6. The optical shutter according to any of claims 1-5, wherein the row electrodes (112a-g) of the first electrode pattern (112) are positioned so that they overlap the electrode gaps of the second electrode pattern (122) and vice versa.

7. The optical shutter according to any of claims 1-5, wherein the row electrodes (112a-g) of the first electrode pattern (112) are positioned so that they overlap the row electrodes (122a-g) of the second electrode pattern (122) and vice versa.

8. The optical shutter according to any of claims 1-7, wherein the maximum distance (g) between the row electrodes of at least one of said electrode patterns is less than approximately twice the mutual distance (d) between the first and second substrates.

9. The optical shutter according to any of claims 1-8, wherein the mutual distance (d) between the first and second substrates is between 4 micrometers and 40 micrometers, and more preferably between 10 micrometers and 30 micrometers.
10. The optical shutter according to any of claims 1-9, wherein the optical shutter is arranged to be operated with voltages of between 50 volts and 300 volts, and more preferably between 100 volts and 200 volts.
11. The optical shutter according to any of claims 1-10, wherein the optical shutter is arranged to be switched between a high light scattering state, and a high transparent state
12. The optical shutter according to any of claims 1-11, wherein the liquid crystal material comprises cholesteric liquid crystals.
13. The optical shutter according to any of claims 1-12, wherein the row electrodes on at least one of the substrates consists at least in part of a series of geometrically linear lines, preferably with constant thickness.
14. The optical shutter according to any of claims 1-12, wherein the row electrodes on at least one of the substrates consists at least in part of a series of rows that are non-linear.
15. The optical shutter according to any of claims 1-12, wherein the row electrodes on at least one of the substrates consists at least in part of a series of zigzag lines, preferably with constant thickness.